Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Amendment to Part 15 of the Commission's	)	RM-11666
Rules to Permit the Operation of Vehicular	)	
Radar Systems in the 77-81 GHz Band	)	

COMMENTS OF TREX ENTERPRISES CORPORATION

Trex Enterprises Corporation ("Trex"),[1] by its attorneys, submits these comments in response to the Petition for Rulemaking ("Petition") that was filed by Robert Bosch, LLC ("Bosch") and placed on Public Notice on July 17, 2012.[2] Bosch asks the Commission to open a rule making for the purpose of modifying section 15.253 of the Commission's rules to permit the operation of unlicensed, short-range vehicular radar systems (SRR) in the 77-81 GHz band on the same basis that SRR systems are operated at 76-77 GHz.

Trex has a direct interest in this proceeding because it was granted a waiver to permit certification and use of its foreign object debris (FOD) radar detection equipment operating in the 78-81 GHz band, pending the outcome of a separate rulemaking proceeding to amend the Commission's rules to permit use of the 78-81 GHz band for FOD detection radar.[3] Trex's comments are directed at two aspects of the Petition.

---

1 Trex is a diversified high-technology company specializing in cutting-edge technological solutions and products to improve performance across the electromagnetic spectrum. Trex has developed a strong base of proprietary technologies in microwave sensing, high resolution imaging, digital signal processing, and applied optics and materials. Trex is a privately-held company, with headquarters in San Diego, California and facilities in New Mexico, Hawaii (Honolulu, and Maui), and Massachusetts.

2 Public Notice, Office of Engineering and Technology, Petition for Rulemaking Filed, DA 12-1139 (July 17, 2012).

3 Amendment of the Commission's Rules to Permit Radiolocation Operation in the 78-81 GHz Band; Request by the Trex Enterprises Corporation for Waiver of Section 90.103(b)

First, Bosch raises in its Petition substantially the same points made in the comments it submitted in the separate *FOD Rulemaking* on the compatibility of the FOD radar detection system with automotive SRR radars.[4] Trex addressed in reply comments[5] the points raised by Bosch and fully anticipates that the Commission will make a determination on any relevant points in the order it issues in that separate proceeding. Nevertheless, Trex herein provides technical information to demonstrate the compatibility between its FOD detection radar system and automotive SRR systems.

FOD radars can, in fact, be operated without any necessary interaction with automotive SRR systems, as Bosch anticipates.[6] Trex's FOD Finder radar system operates in a significantly different manner than the automotive SRR systems. Unlike SRRs that radiate in multiple directions from a vehicle,[7] the FOD Finder radar forms very narrow, pencil-like beams that point downward and rapidly scan in both the horizontal and vertical directions the flat surface of the airport runway. Under typical operating conditions, the pencil-like beam scans 90 degrees horizontally and 5 degrees vertically. Given the radar antenna dimensions and illumination taper, its angular beam size as measured between first zeros in the beam pattern is 0.45 degrees horizontally and 1.3 degrees vertically. The full 90 degrees wide horizontal scan takes 4 seconds. Considering these system parameters, the time dwell on any target is 4 sec * (0.45/90) * (1.3/5) = 3 milliseconds. Due to such short duration of potential interference exposure, Trex submits that the most accurate and useful way to evaluate the FOD radar's

---

of the Commission's Rules, *Notice of Proposed Rulemaking and Order*, 26 FCC Rcd 17476 (2011) ("*FOD Rulemaking*").

4 Petition, ¶¶ 23-28.

5 Trex Reply Comments, WT Docket No. 11-202 (filed Feb. 27, 2012)

6 Petition, ¶ 23.

7 Petition, ¶ 24.

potential impact on automotive SRR is by using the maximum transmitted peak power criterion, which is defined by ETSI for SRR systems at 55 dBm EIRP when measured within a 50 MHz bandwidth.[8]

At peak transmit power, the FOD Finder radar is capable of producing up to a 65 dBm (EIRP) power level. But for the typical short range distance (defined as 300 meters or less) mobile operating version of the FOD Finder radar, the actual transmit power operates at 10-20dB lower than the 65 dBm maximum, as the radar sensitivity is mostly limited by the ground clutter. Using the lower actual transmit power for mobile operations, the corresponding EIRP level is below the 55 dBm EIRP ETSI limit. The FOD Finder is also capable of operating in a fixed (*i.e.*, stationary) position for longer range distances (defined as greater than 300 meters). For the long range fixed operations, the full 65 dBm transmit power is preferred.

Because the beam of the radar is always pointed downward to the ground for debris detection and the runways are set back considerable distances from public roads near airports, the only potential impact that the FOD Finder radar could have on automotive SRR radar equipment operating on the nearby pubic roadways would result from ground reflections and from the scattering of the FOD Finder beam. But the RF attenuation that results from the interaction of ground reflection and beam scattering would considerably reduce the EIRP power. Accordingly, the downward beam orientation of the FOD Finder radar ensures that it will be able to operate within the maximum EIRP power limits and not adversely affect SRR equipped automobiles traveling on public roadways in the areas outside the airport environment even at full available transmit power. In addition, the first sidelobe level of the antenna is lower than -18 dBi relative to the center of the main beam which ensures that the power transmitted through the

[8] *See ETSI EN 302 264-1* § 7.1.3 Maximum radiated peak power (EIRP).

sidelobe even in the case of the direct hit of the SSR radar antenna will be well below the 55 dBm EIRP limit.

Indeed, the above explanation of how the FOD radar system operates is consistent with Bosch's observation on the compatibility between systems. As Bosch observes –

> [I]f FOD radars at airports utilize directional antennas, aimed in a generally downward direction toward an airport runway, that configuration, despite the mounting of the radar on a motorized vehicle moving the FOD radar back and forth along airport runways will likely minimize interference on public roadways adjacent to airports. The operating and installation configuration of the radar, coupled with the limited propagation characteristics of the 77-81 GHz band, could provide sufficient protection for SRR operation in the band.[9]

To ensure FOD radars use downward directed antennas, Bosch urges that FOD radars be operated on a licensed basis.[10] As explained above, Trex's FOD Finder antenna is highly directional and because it points at a small point on the runway it will not illuminate a public roadway. Accordingly, Trex is not opposed to the Commission adopting the licensing condition proposed by Bosch that the applicant certify that the FOD radar will be mounted and utilized so that when in use it does not, within the main beamwidth of the antenna (azimuth or elevation), illuminate a public roadway near the airport.

Bosch also believes that FOD radars should not be authorized without compatibility studies.[11] Trex submits that such studies are unnecessary because unlike SRRs, which radiate in multiple directions from a motorized vehicle, FOD radars utilize highly directional antennas aimed in a downward direction. Bosch itself confirms that such operating

---

9 Petition, ¶ 24.

10 Petition, ¶ 25.

11 Petition, ¶ 28.

characteristics "could provide sufficient protection for SRR operation in the 78-81 GHz band."[12] In light of the information presented by Trex regarding the operating characteristics, Bosch has not presented any evidence to demonstrate the need for compatibility studies.

Second, the Petition raises a fundamental issue about how the Commission should maximize spectrum use. Given the scarcity of spectrum resources and the likelihood that other technologies other than SRR could make valuable use of the 77-81 GHz band,[13] the Commission should examine closely why SRR systems require an additional 4 GHz of bandwidth to deploy their technology, particularly when 2 GHz of bandwidth has been sufficient in the past. Trex agrees that the proposed SRR systems are important for collision mitigation and traffic safety in the U.S. But that does not necessarily mean an additional 4 GHz of bandwidth should be allocated. Instead, in addressing Bosch's request for such a significant amount of spectrum, the Commission should ensure that the entire 77-81 GHz band is utilized efficiently, flexibly, and no part of the band is unnecessarily inhibited. In short, the Commission should be careful not to adopt rules that would unreasonably restrict additional, valuable uses of the band.

Likewise, Trex urges the Commission to insist that the SRR systems demonstrate that they have incorporated high performance receivers into their design. Spectrum allocations

---

12 Petition, ¶ 24.

13 For example, Trex has already fielded for the US Army a developmental radar at 78-81 GHz to aid military helicopter pilots attempting to land in so-called "brownout" conditions, in which upwelling from the helicopter rotor blades creates a virtual sandstorm and blinds pilots attempting to land rotorcraft in the desert. Brownout landing assistance is currently one of the US Army's highest priority technology developments based on recent and ongoing theater operations in Iraq and Afghanistan. Trex has also already fielded for the US Army a developmental radar at 78-81 GHz to aid ground vehicle drivers and autonomous vehicles with 3-dimensional vision for navigating in poor visibility conditions caused by sandstorms, fog, smoke, and/or volcanic ash. The high degree of range resolution provided by the wide available bandwidth at 77-81 GHz makes this band uniquely and widely useful for 3-D imaging applications of great importance for a variety of related missions, potentially even to include concealed weapons detection.

are optimized by high performance receivers with the ability to tune into signals intended for them and to reject or ignore all others. Because it is proper for the Commission to require greater performance for each generation of receivers, the SRR systems should be required to deploy receivers in spectrum allocated in this proceeding at higher standards than exist today.

Conclusion. For the foregoing reasons, Trex respectfully urges the Commission to incorporate the above recommendations in connection with any action taken regarding Bosch's request.

Respectfully submitted,

_____

Thomas Cohen
Randall W. Sifers
KELLEY DRYE & WARREN LLP
3050 K Street, NW
Suite 400
Washington, DC 20007
tcohen@kelleydrye.com
rsifers@kelleydrye.com
t: (202) 342-8601
f: (202) 342-8451

Counsel to
Trex Enterprises Corporation

August 16, 2012